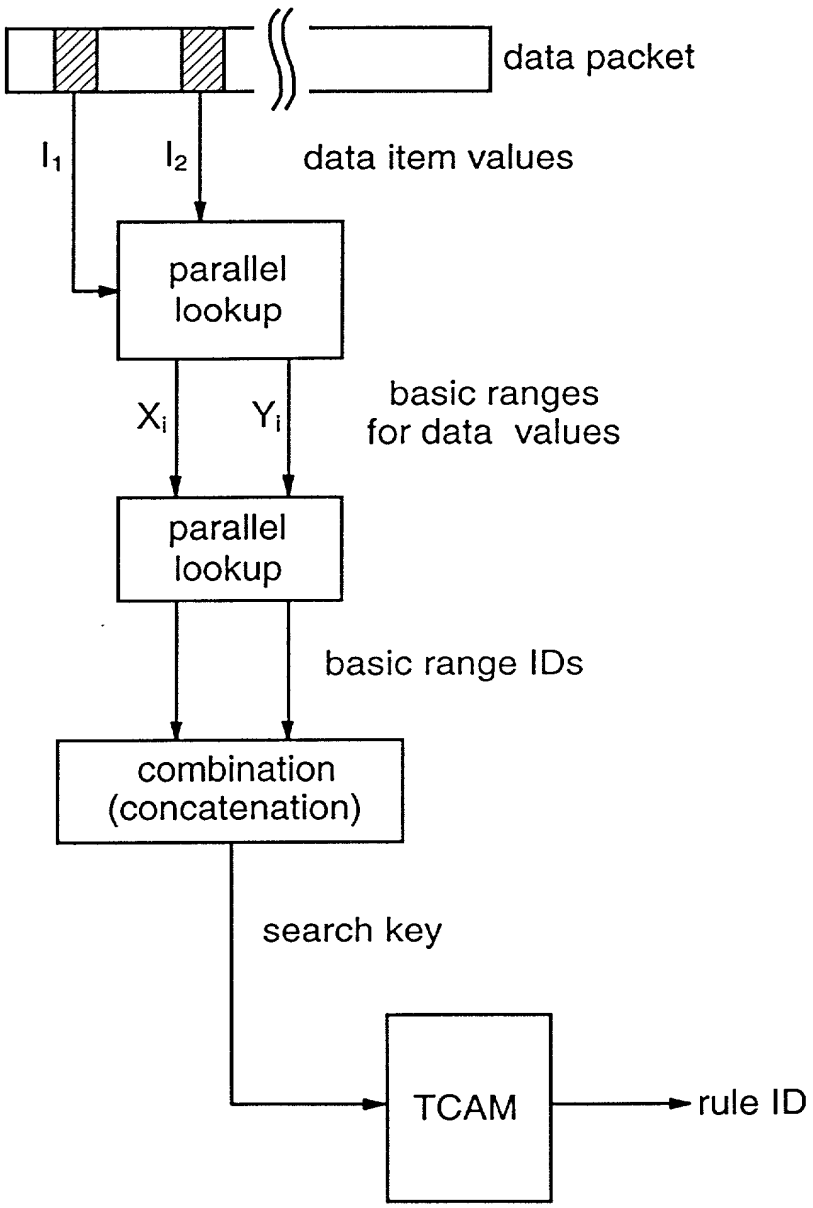
data packet
$I_1$
$I_2$
data item values
parallel lookup
$X_i$
$Y_i$
basic ranges for data values
parallel lookup
basic range IDs
combination (concatenation)
search key
TCAM
rule ID

Figure 1

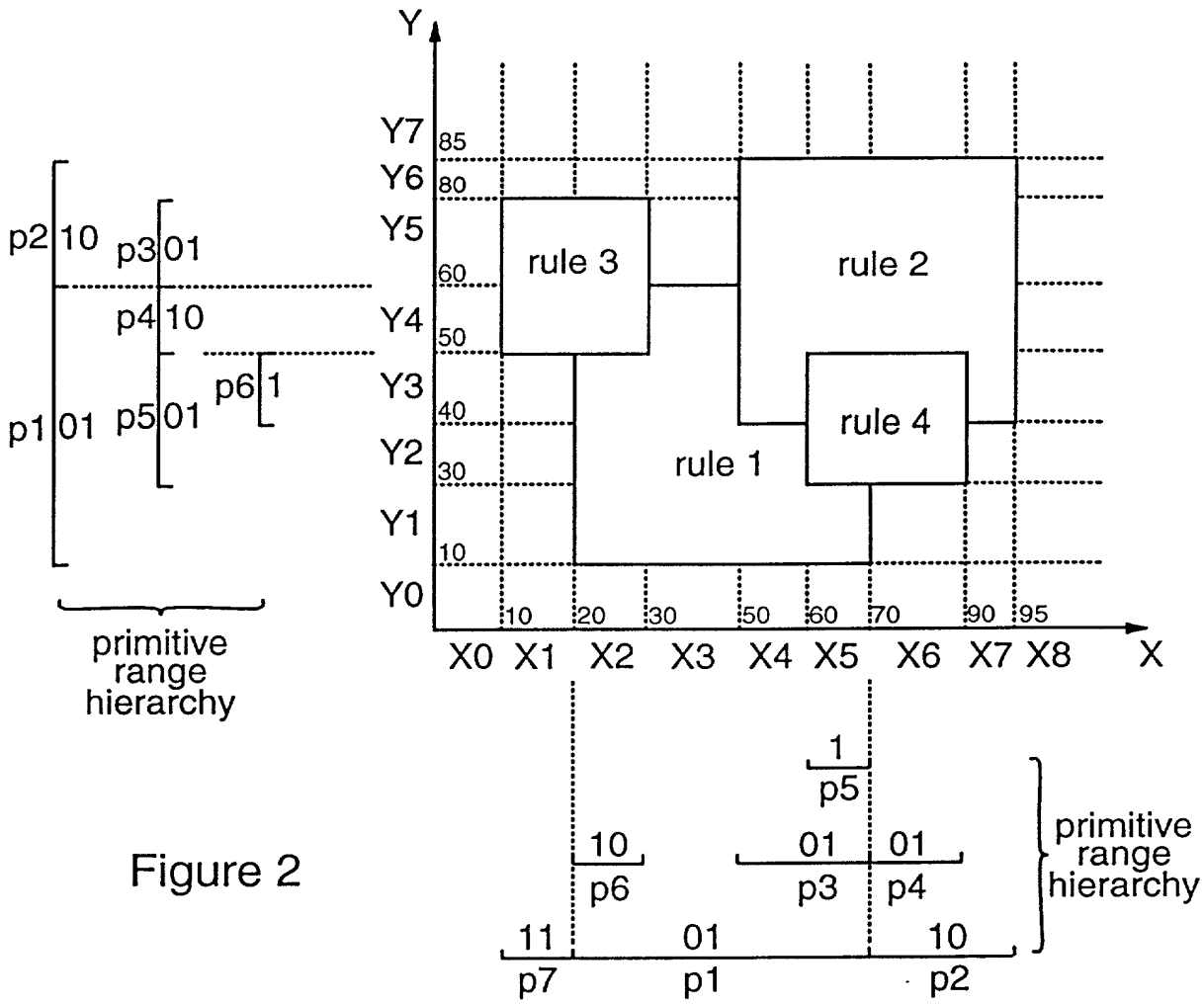


Figure 2

| Basic Range | Basic Range ID | Basic Range | Basic Range ID |
|---|---|---|---|
| X0 | 00000 | Y0 | 00000 |
| X1 | 11000 | Y1 | 01000 |
| X2 | 01100 | Y2 | 01010 |
| X3 | 01000 | Y3 | 01011 |
| X4 | 01010 | Y4 | 01100 |
| X5 | 01011 | Y5 | 10010 |
| X6 | 10010 | Y6 | 10000 |
| X7 | 10000 | Y7 | 00000 |
| X8 | 00000 | | |

Figure 3

| Entry | Rule Vector | Rule ID |
|---|---|---|
| 1 | 1001X0101X | rule 4 |
| 2 | 010110101X | rule 4 |
| 3 | 0110X1001X | rule 3 |
| 4 | 0110X0110X | rule 3 |
| 5 | 11XXX1001X | rule 3 |
| 6 | 11XXX0110X | rule 3 |
| 7 | 10XXX0110X | rule 2 |
| 8 | 10XXX01011 | rule 2 |
| 9 | 10XXX10XXX | rule 2 |
| 10 | 0101X0110X | rule 2 |
| 11 | 0101X01011 | rule 2 |
| 12 | 0101X10XXX | rule 2 |
| 13 | 01XXX01XXX | rule 1 |

Figure 4

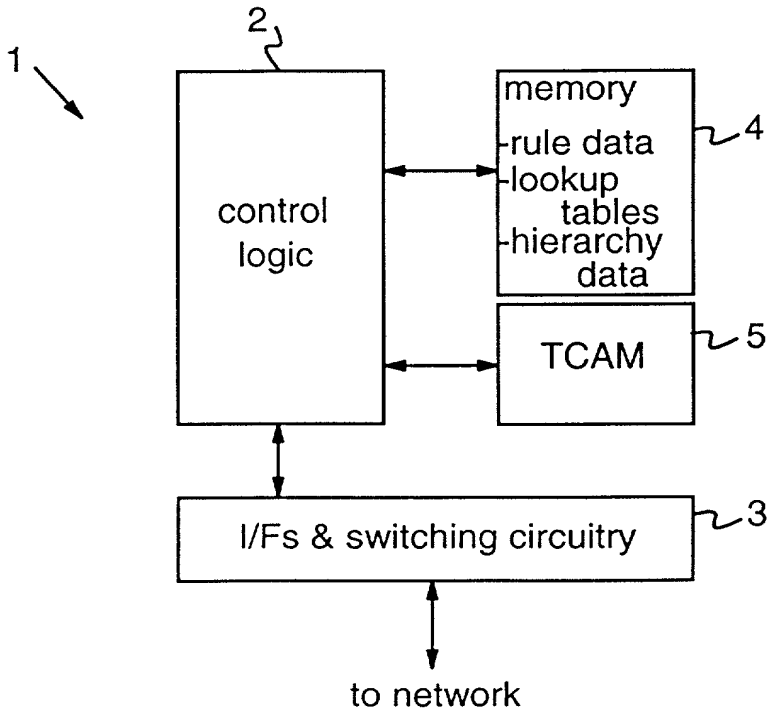


Figure 5

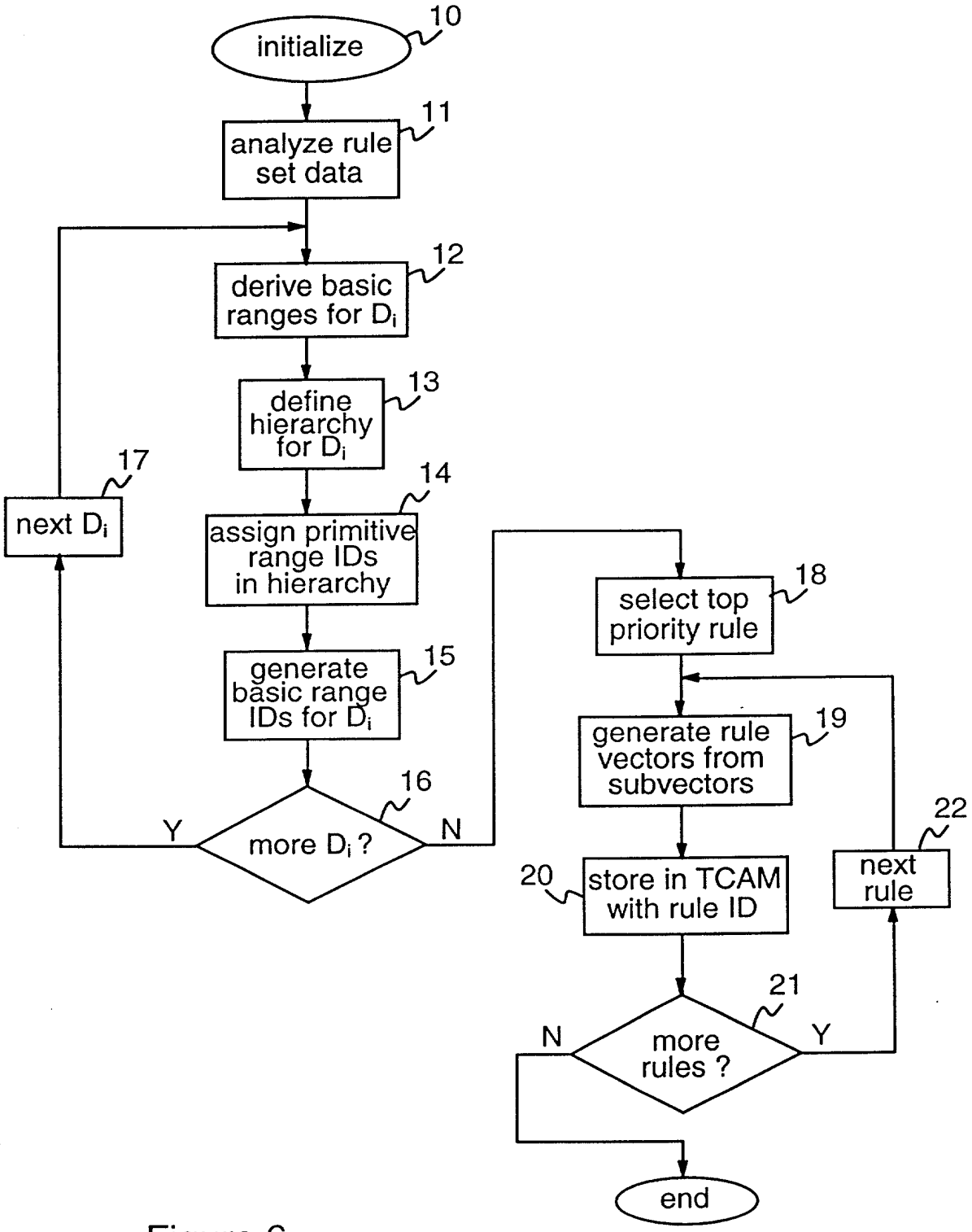
initialize
10
analyze rule set data
11
derive basic ranges for $D_i$
12
define hierarchy for $D_i$
13
assign primitive range IDs in hierarchy
14
generate basic range IDs for $D_i$
15
more $D_i$ ?
16
Y
N
next $D_i$
17
select top priority rule
18
generate rule vectors from subvectors
19
store in TCAM with rule ID
20
more rules ?
21
N
Y
next rule
22
end

Figure 6

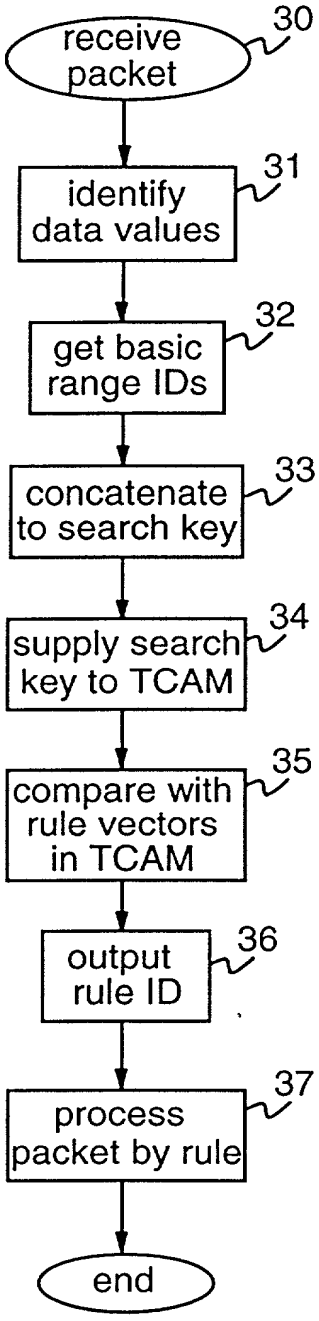
receive packet
30
identify data values
31
get basic range IDs
32
concatenate to search key
33
supply search key to TCAM
34
compare with rule vectors in TCAM
35
output rule ID
36
process packet by rule
37
end

Figure 7

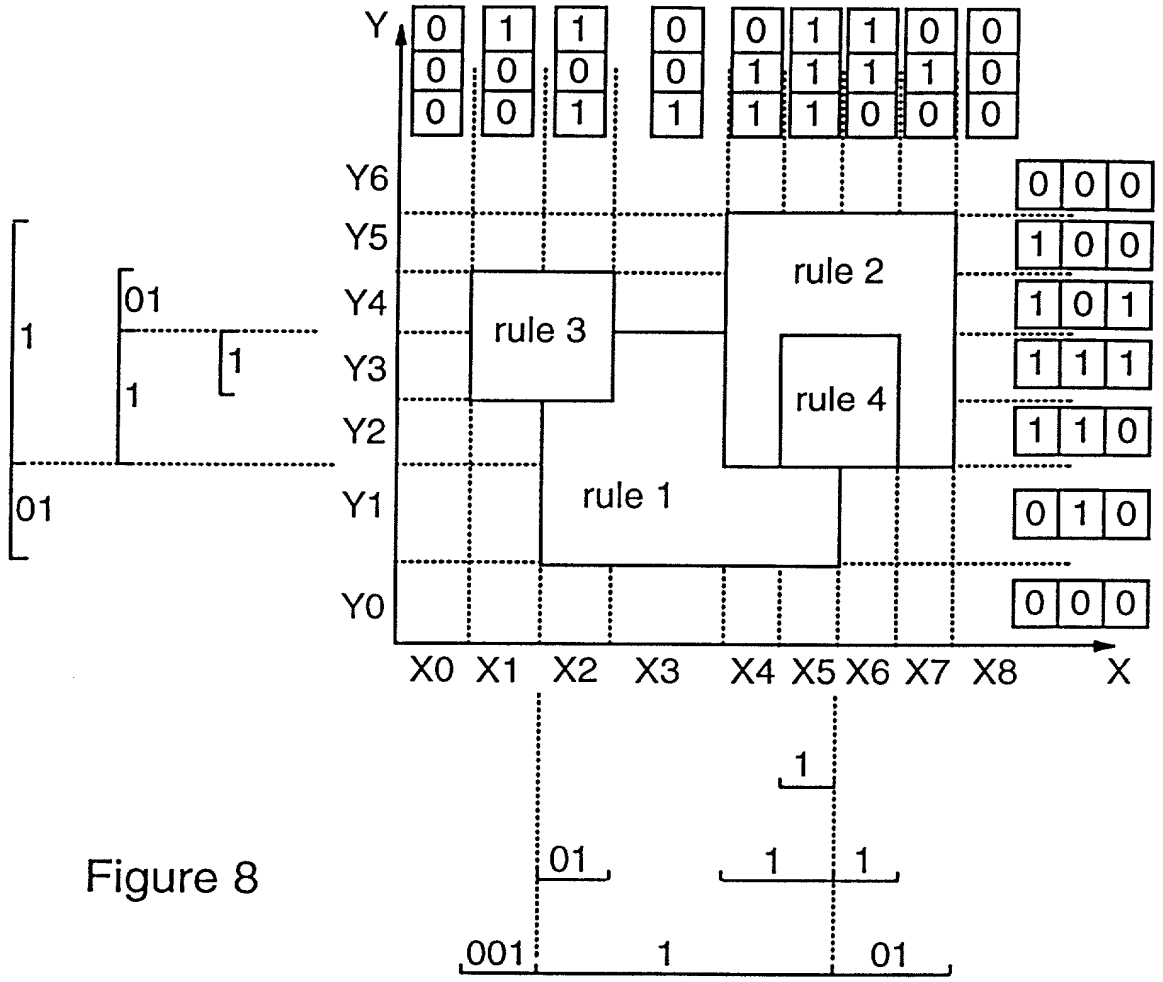


Figure 8

| Rule Vector | Rule ID |
|---|---|
| X1111X | rule 4 |
| X011X1 | rule 3 |
| X1X1XX | rule 2 |
| 1XXX1X | rule 1 |

Figure 9

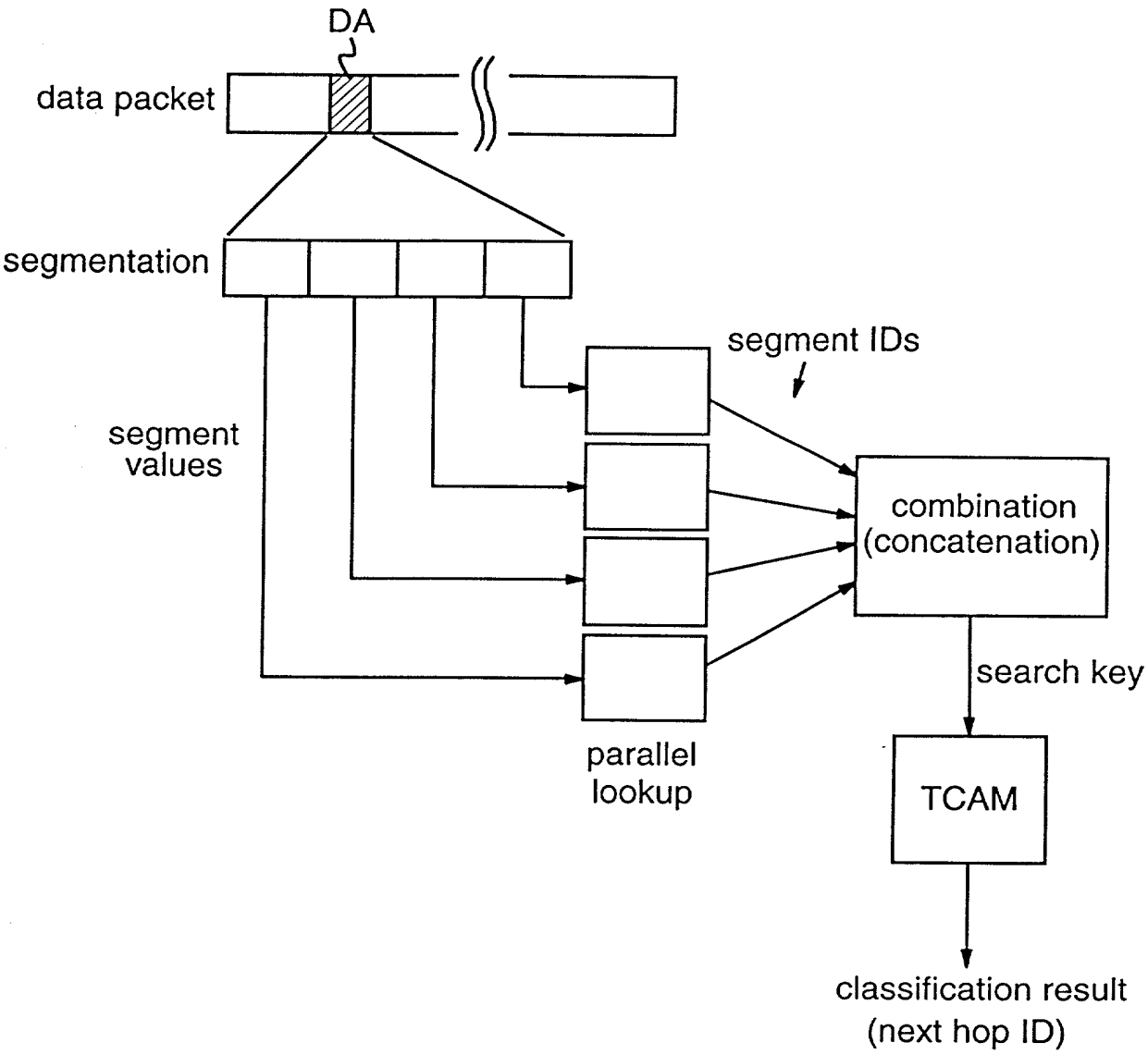
DA
data packet
segmentation
segment IDs
segment values
combination (concatenation)
search key
parallel lookup
TCAM
classification result (next hop ID)

Figure 10

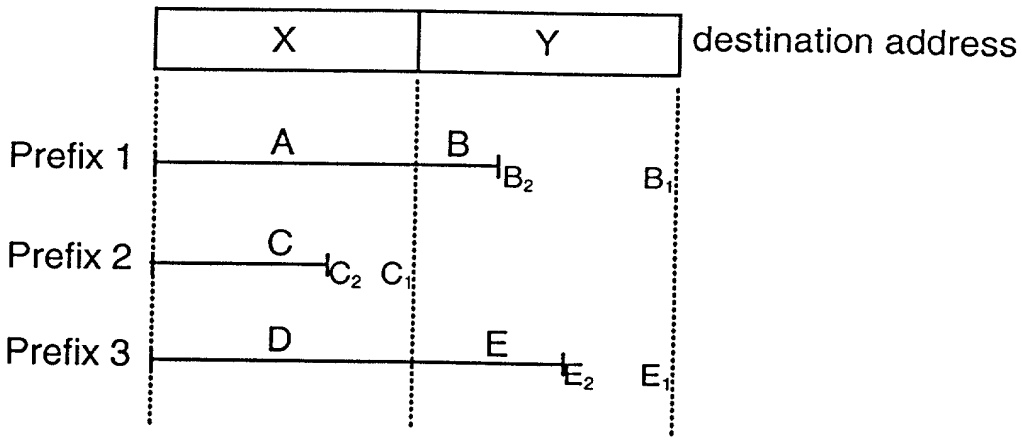


Figure 11

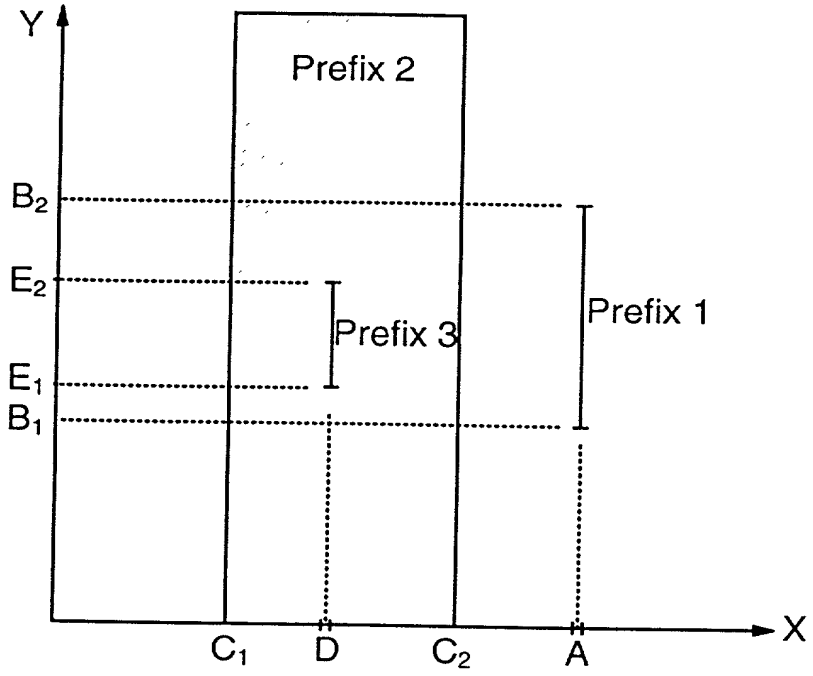


Figure 12